The Hugo Notebook:

Lessons from a Hurricane

Problem: *Availability of Maps*

Discussion: The engineer relief effort was slowed because of a shortage of maps. Additionally, the maps that were available did not provide the detail needed to support engineer relief operations.

Recommendation: Each county should establish a supply of large-scale maps which can be given to relief organizations. An engineer company needs about 30 maps. The ideal county map would show all roads, location of all powerlines, and have an overprint of the UTM grid system. The ideal urban map, for towns with populations over 10,000, would show all streets and roads by name. Each map would also show the location of all government buildings, including schools, armories, fire stations, court houses, etc. A map showing the entire power distribution network (minus the drops to individual buildings) would be helpful for all engineer headquarters, from company level on up.

Problem: *Combat engineer companies did not have enough chain saws to support the requirement for clearing roads and power lines.*

Discussion: Engineer companies have nine chain saws, one per engineer squad; one pneumatic saw; and one hydraulic saw with each Small Emplacement Excavator (SEE). There were not enough organic saws to keep the squads busy, and when saws had to be pulled off-line for maintenance, the problem became more acute. Fortunately, many privately owned saws were loaned to the engineers by local individuals and organizations.

Recommendation: For such intense relief work, provide one chain saw for every four workers, with an additional 30 percent maintenance float.

Problem: *Utilities companies were not able to identify work requirements fast enough to keep engineer units fully employed.*

Discussion: Engineer units were initially allocated at one company per county in the inland counties. Storm damage in these areas was sporadic, with many small areas of downed trees throughout affected counties. Often these areas required only a few squad hours to clear, leaving the squad free for a new mission in another area. However, utilities personnel were unable to identify work areas quickly enough to keep the engineers moving from site to site without delay. Delays in determining whether downed powerlines were "hot" also caused undue delays in relief work.

Recommendation: The work output of engineer units can be considerable, but they can be fully utilized only when jobs are available. While utilities companies are understandably strapped for personnel during such weather emergencies, an ideal arrangement would be to place a utilities representative with each engineer platoon. The representative should be equipped with a four-wheel-drive vehicle, a portable telephone, a large-scale map of the area, and the ability to determine if powerlines are hot.

Problem: *Private and commercial vehicles required special consideration for access and egress from ribbon bridge ramps.*

Discussion: Private and commercial vehicles often do not have sufficient power, traction or road clearance to load and off-load from a ribbon bridge. The steeper the slope of the ramp, the fewer non-military vehicles that can use it.

Recommendation: When a ribbon bridge is to be used by civilian vehicles, access and egress ramps should slope as gently as the ramp bay will allow.

Problem: *State-mandated work priorities for Army engineers were not fully understood by local civil authorities.*

Discussion: Early in the relief effort, the governor established priorities for engineer work. The priorities were well understood within the military community, and they did not change throughout most of the relief effort. However, there was a need to constantly reemphasize and restate those priorities to county officials who directed the engineer work. When work was requested that fell outside of the governor's guidelines, it was denied by the engineers. Unfortunately, this caused some unnecessary friction between civil and military personnel.

Recommendation: To avoid misunderstandings, the state should ensure that local officials are fully informed of the governor's instructions for the use of Army engineer assets.

Problem: *Congested roads in urban areas significantly slowed engineer relief efforts.*

Discussion: During the first several days after the hurricane, the city of Charleston remained open and relatively free of traffic. The lack of significant private or commercial traffic allowed engineer units to move freely among work sites. However, the situation changed drastically after the first few days. The roads became choked with returning property owners, commercial vehicles, and sightseers. With the roads only partially cleared of debris and traffic lights still out of operation, traffic in parts of the city reached gridlock.

Recommendation: Civil authorities should restrict access to urban areas as much as possible until roads are cleared and traffic lights operational. Also, traffic control units, military or civilian, are needed to ensure that the relief work of engineer units is not hindered by traffic snarls. If possible, some routes should be dedicated to military and relief vehicles.

Problem: *Units did not perform route reconnaissance before sending company convoys into the storm damaged areas.*

Discussion: Engineer companies were sent into damaged areas in the early morning of September 22, only hours after the storm had passed. Company convoys were put on the road without the benefit of either ground or aerial reconnaissance of the route. The convoys were frequently stopped by trees that blocked the roads. Movements that could have been completed in less than 2 hours on open roads took upwards of 6 hours because of downed trees.

Recommendation: A squad of engineers in a HMMWV, with a supporting SEE, bucket loader or backhoe, should be sent out as a point team to clear roads ahead of the convoy.

Issue: *Identification of storm damage categories and engineer work requirements.*

Discussion: During the relief effort, military engineers were used to perform the following tasks:

a. *Clearance of trees.* Clearing roads and powerlines of downed trees was the most common storm damage encountered by Army engineers.

b. *Rubble on streets.* Rubble, primarily roofing material, blocked many roads. Initial clearing efforts consisted of pushing most debris to the sides of the roads. In some areas, there was so much debris that it was necessary to haul it away. Salvageable property, such as private vehicles or even entire houses, sometimes blocked roads.

c. *Sand deposits on roads.* Roads in beach areas were buried under sand up to several feet deep.

d. *Erosion breaches around bridges and culverts.* Roadways were destroyed and hundreds of cubic feet of roadbed material were washed away by waves and subsequent tidal action.

e. *Landfill operations.* As landfills became full, it was necessary to use Army bulldozers to keep the landfills open.

Recommendation: Military engineers with hurricane-related area damage-control missions can use this list of damage categories for their initial operations planning.

Issue: *Use of the Small Emplacement Excavator (SEE) during relief operations.*

Discussion: Engineer units of the South Carolina National Guard used their recently issued SEEs during the Hurricane Hugo relief effort. The SEEs were found to be very reliable and well suited to the mission. The vehicle's high mobility allowed it to keep up with engineer work teams moving in HMMWVs and dump trucks. It had sufficient power to push and/or lift tree trunks that blocked roadways. The hydraulic chain saw was used extensively. It was found to be lightweight, easy to use, reliable, and powerful. In some cases, the bucket of the SEE was used to provide an elevated work platform for engineers who were clearing tree limbs from power lines.

Recommendation: None.